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not belong to it. Some of its members desire to make it a school for teaching science to the young, a function which does not belong to an academy of sciences, but to a university or other school. That the primary object of the academy has always been original research, is well known; and that it is the desire of most of the scientific specialists connected with it that it should be devoted to that purpose, is undoubted. Instruction to post-graduates might be given in connection with its laboratories of research, but not to such an extent as to interfere with the main object.

The inaugural address of Professor Sharp was a clear exposition of the methods employed in some of the continental laboratories, and furnished an outline for work to be done in his own department, invertebrate zoölogy, in the academy.

One reason for introducing this institution so frequently to the notice of our readers is, that it is representative of the average local American "Academy of Sciences." If these institutions are ever to resemble their prototypes of the old world, it will have to be by a process of growth something like that which the oldest academy in the country is undergoing. They will have to pass from the club stage to the working stage, and self-preservation will require a third more or less exclusive stage. The obstacles to be overcome will be very similar everywhere.

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RECENT LITERATURE.

DUTTON'S TERTIARY HISTORY OF THE GRAND CANON DISTRICT.[1]—This elaborate monograph on perhaps the most imposing gorge in the world, has been thoroughly well done and superbly illustrated. The author gives a rapid summary in the twelfth chapter of the changes which have taken place and have produced the present wonderful scenic features of this region. Before the Carboniferous period thick beds of Silurian and thinner deposits of Devonian sediments were laid down, though a guess whence they were derived is not hazarded. The region was then upheaved, enormously eroded and again submerged. Upon the eroded surface the Carboniferous rocks were unconformably deposited, and the deposition of sediment was continued until the end of the Mesozoic, resulting in the accumulation of from 12,000 to 16,000 feet of strata over the entire Plateau province. The Carboniferous deposits may have accumulated in an ocean of moderate depth, but the Mesozoic beds were all shallow-water deposits, and they sank as rapidly as they accumulated.

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[1] *United States Geological Survey.* J. W. POWELL, director. Tertiary History of the Grand Cañon district, with atlas. By Captain CLARENCE E. DUTTON, U. S. A. Washington, Government Printing Office, 1882. 4to, pp. 264.

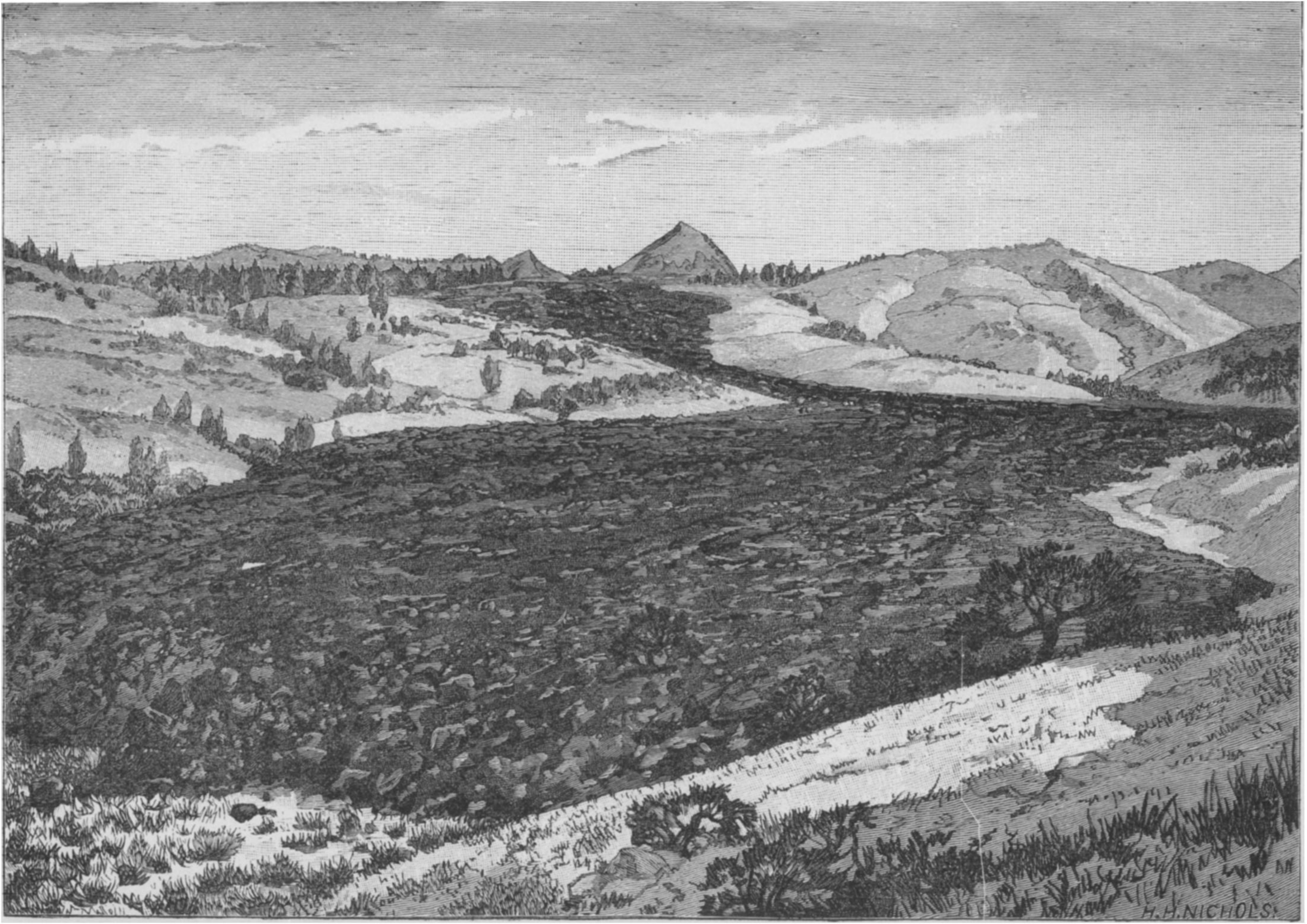
"Near the close of the Cretaceous, signs of the coming revolution make their appearance. The waters became brackish, indicating a restricted access of the ocean. At the close of the Cretaceous important disturbances took place, and portions of the province were uplifted and denuded. These were again submerged, but the new conditions differed from the old, for the new deposits (Eocene) laid down unconformably upon the Cretaceous and Jurassic are of fresh-water origin, indicating that a great lake was formed. The extent of this lake corresponds very nearly with that of the Southern Plateau province itself, but not exactly. Near the Middle Eocene began that slow action which has gradually elevated the western portion of the continent, and which has prevailed until a recent epoch."

During the Tertiary, erosion went on continuously, the thickness removed from some large areas amounting to about 10,000 feet, and much the greater part of this denudation was probably accomplished by the close of the Miocene.

"The Colorado river appears to have originated in very early Tertiary time as the outlet of the great Eocene lake, and has persisted in its course ever since. It has been the main track along which the waste of the province has been carried to the Pacific. At its beginning its bed lay in Eocene strata, and as the land rose it cut down its channel by corrasion, severing in succession all the beds of the Mesozoic and Carboniferous systems. That portion of it which constitutes the Grand and Marble cañons has cut through 10,000 to 16,000 feet of beds, reaching a maximum amount in Kaibab. The present Grand cañon represents only the corrasion through the Carboniferous and into the Archæan. The older corrasion of superior beds becomes manifest only when we restore, in imagination, the Mesozoic strata which have been denuded from the vicinity of the chasm. The present Grand cañon, therefore, is the work of late Tertiary and Quaternary time. Although we cannot fix with precision the exact epoch at which the river first penetrated the Carboniferous beds, we may, in roughly approximate language, place that epoch near the beginning of the Pliocene or close of the Miocene."

Among the more interesting points elucidated besides the gorges of the Colorado, are the basaltic eruptions of older and some of very recent date. After describing the ancient basalts of Mt. Trumbull and other masses, which are much eroded, attention is then drawn to the fields of recent basalt, which look "as fresh as any *coulée* of Vesuvius ejected twenty or thirty years ago." Plate xx represents one of these fields. Compared with the other later eruptions of the Uinkaret, its dimensions are larger than the average. It entire surface is covered with blocks of pumice of the most delicate kind. It has a texture very much

PLATE XX.



Recent Lava Flow on the Uinkaret.

like the lightest coke, the vesicles, however, being considerably larger than those of the ordinary coke, and very uniform throughout. The septa between the vesicles are very thin, and the whole mass is so light that when a specimen is varnished over to prevent access of water to the cavities, it floats upon water like a cork. * * * Any attempt, however, to fix the age of these lavas must prove quite fruitless. All that we can say is, that it is very recent, even when time is judged by the historic or human standard. It cannot be many centuries old, and it may be more recent than the Spanish conquest. But there are reasons why lavas should here preserve for centuries the freshness which is lost in other countries in as many decades. The climate is arid, and there can be no question that the chemical action of the meteoric agents upon the lavas proceeds here with extreme slowness.

The volume ends with a discussion of the mode of excavation of the Grand cañon, of corrasion and weathering, and finally with a treatment of the details of its erosion.

Not only for its full and well written account of the geology of an extensive as well as not very accessible region, will the volume have its use, but especially as a contribution to dynamical geology, with regard chiefly to the action of running water and weathering, will this volume possess permanent value.

It is hardly necessary to add that the pencil of Mr. Holmes, whose genus for sketching geological panoramas is almost unique, has added materially to the value of the work. The wood-cuts and photo-engravings are drawn in his superior manner, while the chromo plates evince his facility in the use of water-colors.

Capt. Dutton's style and mode of handling his subject is clear and elaborate, and worthy of the subject. The atlas is in Bien's best manner.

GARMAN'S NORTH AMERICAN REPTILES AND BATRACHIANS.[1] —The first-named of these brochures, as a simple catalogue is by itself of little weight as a contribution to science, but as connected with the illustrated paper which bears the second of the titles given below, and as a possible prodromus of others, it deserves attention. The system of the Bulletin No. 1 of the National Museum (which is devoted to this subject) has been so generally adopted by American herpetologists that it becomes necessary that some good reasons should be adduced for the many differences from it which the present system and list present. These reasons have not been given, so far as we are aware, and we think it can be shown that none can be found.

The author of these papers has clearly not been equipped for the task he has undertaken. In the systematic department he

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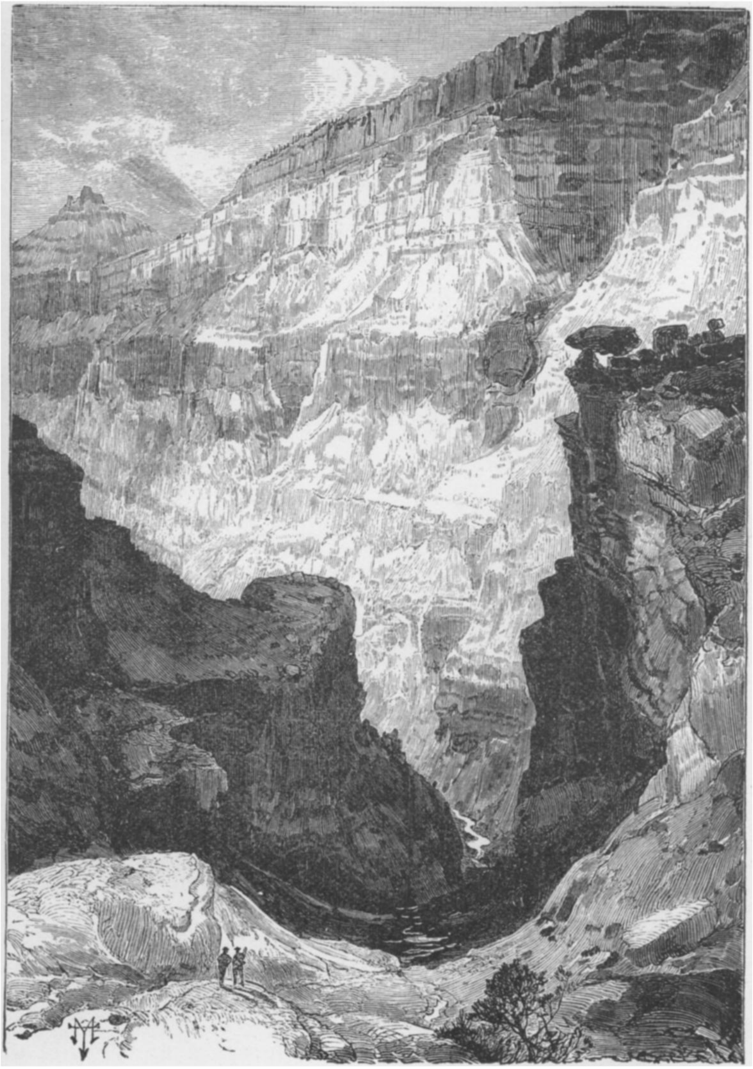
[1] *A list of the species occurring north of the Isthmus of Tehuantepec, with references.* From the Bulletin of the Essex Institute, Salem, Jan., 1884. On the Reptiles and Batrachians [of the Kentucky Geological Survey]. From the memoirs of the Museum of Comparative Zoölogy, Cambridge, Mass. 4to (no date).



A lateral Amphitheater of the second order in the Grand Cañon.